

# Asian or Caucasian? Exploring the Development of Race Categorization in Taiwanese School-Aged Children Using a Morphing Face Paradigm

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The broadly defined other-race effect (ORE) refers to differential processing for own- and other-race faces, such as own-race face recognition advantage and categorization bias for racially ambiguous faces. The present study adopted bi-racial (East Asian and Caucasian) morph face images as stimuli, aiming to explore the development of race categorization in Taiwanese school-age children and adults. In Experiment 1, we tested 33 adults (17 females) on their race categorization of Asian/White morphed faces. In Experiment 2, we tested 65 school-age children (34 girls), divided into three age groups, 7-8 year-olds ( $N = 21$ ), 9-10 year-olds ( $N = 22$ ), and 11-12 year-olds ( $N = 22$ ), with the same task. The morphed face stimuli contained 11 levels (from A100/C0 (100% Asian) to A0/C100 (100% White) in 10% increment); both children and adults were asked to categorize each of the morphed faces as either Asian or Caucasian. The results showed that, as the Asian face component increased, the participants were more likely to categorize the morphed face as Asian. Importantly, for the 50% Asian/White racially ambiguous faces: 7-8 year-olds categorized the faces as Asian whereas 9-10 year-olds, 11-12 year-olds, and adults categorized the face as White. Moreover, the reaction times for the morphed faces of nearly equal Asian and White components (e.g., A50/C50 or A60/C40) were the longest among all, indicating that those faces were rather difficult to categorize. Lastly, we adopted curve fitting (using a 4-parameter sigmoidal function) to estimate individuals' threshold of the Asian component for categorizing as "Asian." The adults' group mean threshold was 56.01%; the group mean thresholds of 7-8, 9-10, and 11-12 year-olds were 49.52%, 54.27%, and 53.13%, respectively, showing a tendency of increasing threshold from age 7 to 12. In summary, our findings provide a cross-cultural comparison on the development of race categorization in school-age children.

**Keywords:** *face perception, other-race effect (ORE), race categorization, school-age children*

## Long Abstract

People are remarkable at processing human faces. In a split second, one can recognize a person's identity, gender, race, or emotion. However, such expertise is only available when the face belongs to one's own racial group (Chien, 2018). In the face recognition literature, the broadly defined other-race effect refers to a collection of phenomena whereby faces of one's own race are processed differently from those of other races. For example, the term *own-race recognition advantage* refers to the well-known observation that own-race faces are

recognized faster and more accurately than other-race faces. The effect of the own-race recognition advantage is robust across experimental settings, age groups, and racial or ethnic groups including Caucasian, African, Japanese, Chinese, and Taiwanese.

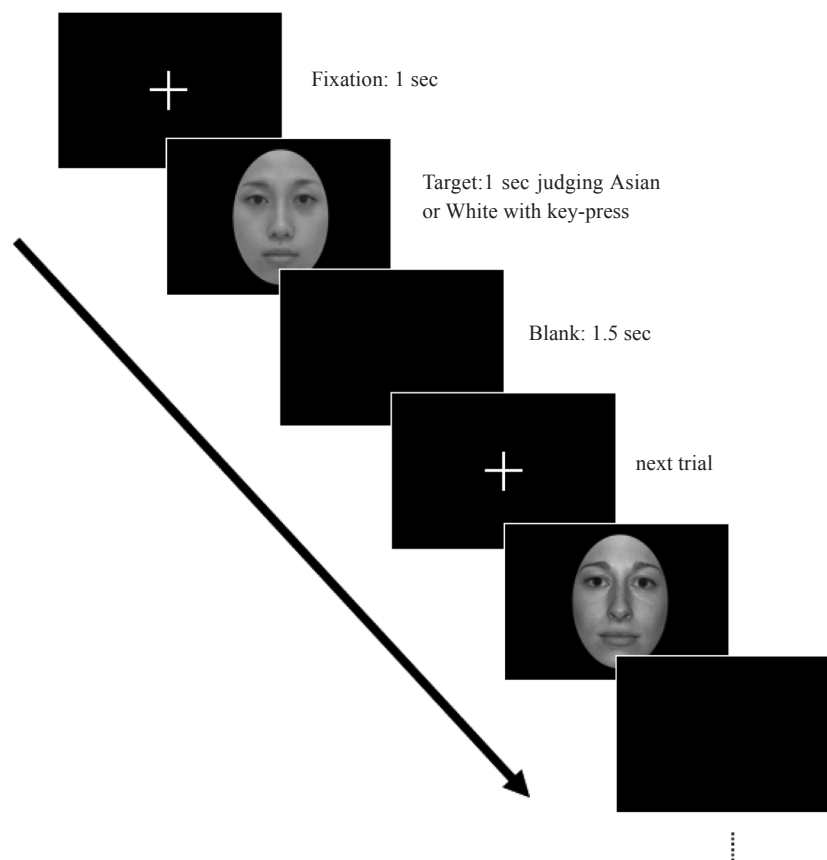
Race is an automatically encoded perceptual and social category; our perception of the race of the individuals we encounter affects our cognitive processing and social evaluation of them. Biases in race categorization are part of the broadly defined other-race effect. In contrast to the abundant literature on the own-race recognition advantage, the *other-race categorization*

*advantage*—whereby people tend to respond faster to other-race faces than to own-race faces when asked to categorize faces by race—is paradoxical and less well understood. A number of theoretical accounts have been proposed to explain the bias and advantage of race categorization. Among these accounts, the *perceptual expertise*-based model stated that people attend to identity-diagnostic characteristics (i.e., configural information around the eyes) in own-race (in-group) faces, whereas paying more attention to the category-diagnostic features (i.e., skin color) of other-race (out-group) faces.

In the last decade, an emerging challenge in bi-racial face categorization has attracted attention. While the classification of mono-racial faces (pure Caucasian or Black) may seem easy, categorizing racially ambiguous faces is difficult, cognitively taxing, and often biased.

Historically, the U.S. employed an official policy of “*hypodescent*,” also known as the “*one-drop rule*,” which states that *the race of a bi-racial child corresponds to that of the “socially subordinate” parent* (Harris, 1964, p.56). Some social psychologists believed that the rule was applied to categorize people of mixed racial or ethnic heritage. Although this policy has since been abandoned, research on ambiguous race categorization suggests that mono-racial adults and children continue to use similar heuristics to categorize racially mixed others. The current research on biracial identity has mostly focused on Black/White individuals and found that participants tend to adopt the hypodescent approach and categorize Black/White biracial individuals as mono-racial Black.

To date, most studies on racial categorization have focused on biracial Black/White faces and have been limited to participants in Western countries. It is unclear



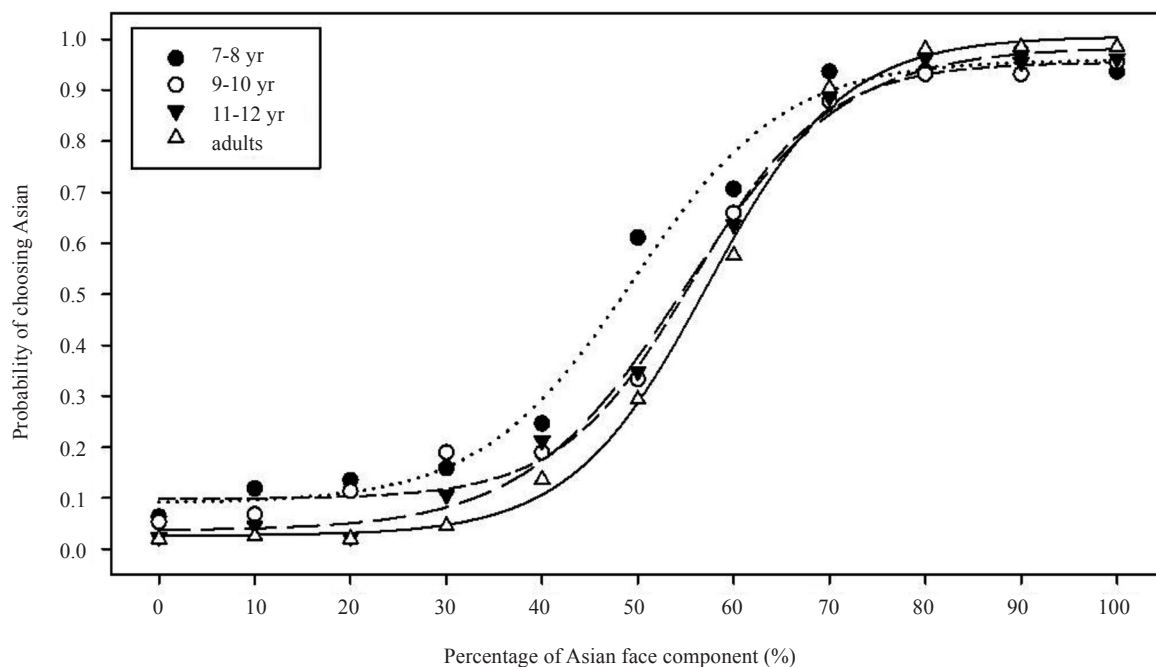
**Figure 1.** Illustration of the experimental procedure

how generalizable the findings are to individuals in Asian countries. Moreover, the quantitative nature of race categorization (i.e., the perceptual threshold) and its development in children are relatively unexplored. This study thus aimed to explore the development of race categorization in Taiwanese school-aged children and adults using a morphing face paradigm to enable the quantitative estimation of the perceptual threshold across age groups.

We adopted the morphing face paradigm based on our previous work (Chen, Yang, & Chien, 2016; Chien, Tai, & Yang, 2018) throughout the study for all age groups. Photographs of the faces of two Asian and two Caucasian females served as models for the face stimuli. The selected faces were in full frontal view with a neutral expression and oval-cropped to remove hair and clothing information with Adobe Photoshop 2. We then used FantaMorph 5.0 (Abrosoft Co.) to generate two sets of morphed images. In each set, we averaged a 100% Asian female face and a 100% Caucasian female face, creating a series of morphed face stimuli on a continuum containing 11 morphing levels from A100/C0 (100% Asian) to A0/C100 (100% White) in 10% increments. All

of the morphed face images were converted to gray-scale. Figure 1 illustrates the procedure. Each trial began with a fixation cross (1 sec) followed by one of the 11 morphing faces presented for 2 sec. Thirty-three adults (17 females) were tested in Exp. 1 and 65 children (34 girls) divided into three age groups, 7-8 year-olds ( $N = 21$ ), 9-10 year-olds ( $N = 22$ ), and 11-12 year-olds ( $N = 22$ ), were tested in Exp. 2. Children and adults were asked to press a key to categorize each of the morphed faces as either Asian or Caucasian, and their responses and reaction times were recorded.

The results showed that as the Asian face component increased, the participants were more likely to categorize the morphed face as Asian. Importantly, for the racially ambiguous 50% Asian/White face, 7-8 year-olds categorized the face as Asian, whereas 9-10 year-olds, 11-12 year-olds, and adults categorized the face as White. Moreover, the reaction times for the morphed faces with almost equal Asian and White components (e.g., A50/C50 or A60/C40) were the longest, indicating that those faces were difficult to categorize. Finally, we adopted curve fitting (using a 4-parameter sigmoidal function,)



**Figure 2.** Curve fitting results of Taiwanese children and adults' racial categorization

$y = y_0 + \frac{a}{1 + e^{-\left(\frac{x-x_0}{b}\right)}}$  to estimate individuals' threshold of the Asian component for categorizing the face as "Asian."  $y_0$  represents the lower asymptote,  $a$  represents the upper asymptote,  $x_0$  represents the middle point of the curve (which is the threshold), and  $b$  represents the slope parameter. The mean threshold in the adult group was 56.01%, meaning that adults did not perceive the face to be Asian until the Asian component was more than 50%. The group mean thresholds for 7-8, 9-10, and 11-12 year-olds were 49.52%, 54.27%, and 53.13%, respectively, showing a tendency for the threshold to increase from age

7 to 12.

In conclusion, the results of this study are consistent with our previous finding that Taiwanese adults exhibited a robust tendency to categorize Asian/White mixed-race faces as White (other-race) (Chen et al., 2016). The results for Taiwanese children are also in line with those of Gaither et al. (2014) and Chen (2017). While younger children exhibited a fairly even categorization, older children, like adults, tended to categorize mixed-race individuals as "out-group" members. In sum, our findings provide a cross-cultural comparison of the development of race categorization in school-aged children.